In an appendix the author shows that the increase in proportion of doubles derivable from old seed is due to the greater longevity of the seeds which lack *X* and *Y*, and not to any change in the genotypic nature of any single seed. She also tried to separate singles and doubles on the basis of seed-characters, but was able to do this only in the sulfur-white race, and then not by the character for doubleness, but by the white or cream plastid-color, which as stated above proved to be coupled with one of the factors for singleness. Ten-week stocks are much branched and the Brompton stocks unbranched. The unbranched condition is recessive, but the ratio is somewhat modified because typically unbranched plants will develop some branches when the terminal bud is injured. Notes are also appended regarding the inheritance of several sap-colors, rose, lilac, terra-cotta, carmine, and crimson.—GEO. H. SHULL.

Biology and taxonomy of Gymnosporangium.—A monograph treating of *Gymnosporangium* both in its biological and its taxonomic aspects is the outcome of several years of experimental and observational work on that genus by KERN.[12] The work is divided into two parts, the first dealing with the biology and the second with the taxonomy of the genus.

In Part I the biology of the genus is discussed under the following general heads: Introduction (including the life history, general characteristics, and nuclear phenomena), distribution and relationships, experimental investigations of life histories, and pathological and economic importance. Particular attention is given to the geographical distribution of the species with reference to the distribution of their hosts. The main facts are arranged in convenient tables. The forms associated with the two sections of *Juniperus* present the most interesting features in regard to their distribution. The species which occur on the section *Sabina* belong either exclusively to the western or exclusively to the eastern hemisphere, while of those occurring on species of the section *Oxycedrus* some are common to both hemispheres and others are limited to one hemisphere. These facts lead the author to the conclusion that the forms found on the older section (*Oxycedrus*), some of whose species are distributed over all the continents of the northern hemisphere, were distributed with their hosts "during a geological period when the land conditions permitted migrations between the northern continents." The author supposes that the section *Sabina* has developed from the section *Oxycedrus* since the continents have become isolated, therefore "we would not expect to find the same species, either of hosts or fungi, indigenous in North America and in the Old World; and this, indeed, is the case." This view of course implies the independent origin of species of the section *Sabina* in the two hemispheres.

Regarding the limited geographical distribution of species of *Gymnosporangium* in cases where both the hosts have a wider distribution, no satis-

[12] KERN, FRANK DUNN, A biologic and taxonomic study of the genus *Gymnosporangium*. Bull. N.Y. Bot. Gard. **7**:392–494. 1911.

factory conclusions can be deduced from the data at hand. The apparently limited distribution of the fungus may merely indicate a scarcity of collections. A table indicating distribution of the species shows in general that the teleutospore generation is more restricted as to its hosts than the aecidial generation. Only 4 genera (5 if the two sections of *Juniperus* are considered as genera) serve for hosts of teleutospores, while 15 genera serve as aecidial hosts, *Crataegus* and *Amelanchier* being in the lead among these. While the aecidial generation has always been regarded as confined to the *Pomeae*, the work of recent years has shown that one form has aecidia on *Gillenia* (*Porteranthus*) of the Spiraeeae, and another on *Fendlera* and *Philadelphus* of the Saxifragaceae, while *G. bermudianum* is autoecious.

Part II comprises the systematic treatment of the genus, 40 species being recognized and described, the descriptions being in most cases accompanied by figures of spores or peridial cells showing characteristic features. Of the 40 species known in the world, 29 are known in their complete life cycle, 7 are known only in their aecidial phase, and 4 only in their telial phase. *Gymnosporangium fraternum*, *G. juvenescens*, and *G. effusum* are described as new, and the aecidial hosts of three species are reported for the first time. The taxonomic treatment is preceded by two sets of keys based respectively on the characteristics of the fungus and on those of the hosts. Most of the species are admirably illustrated by halftone plates.—H. HASSELBRING.

Inheritance of root-form and color in beets and turnips.—The large number of varieties of beets and turnips characterized by distinctive forms and colors of the roots has long invited the attention of experimental breeders, but the very abundance of material has doubtless acted as a deterrent to genetic investigation. KAJANUS[13] has undertaken the difficult task of analysis. As a first approximation to a complete solution of hereditary form-relations in beets, he finds the probable existence of six independent genes affecting the form, namely, two genes (L_1 and L_2) which produce an elongation of the roots, two (A_1 and A_2) which cause the roots to be taper-pointed below, an inhibitor (B) which opposes the action of the elongation-genes, and another (O) which opposes the action of the taper-point genes. When B and O are not present, the long and tapered forms are epistatic over the short and blunt forms, but when these inhibitors are present, the apparent dominance is reversed. The evidence for the existence of these genes consists at present wholly in the occurrence of the ratios 3:1, 15:1, and 1:3 in the F_2. In most of the reported crosses the results run fairly close to these ratios, but

[13] KAJANUS, B., Genetische Studien an *Beta*. Zeitschr. Ind. Abst. Vererb. **6**:137–179. *pls. 9. figs. 2.* 1911.

———, Mendelistische Studien an Rüben. Fühlings Landwirthsch. Zeitg. **61**:142–149. 1912.

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